IN THE CLAIMS:

1. (Currently Amended) A method of creating an electronic data set of ~~an average~~ a natural looking tooth that can be used for creating a dental prosthetic item, a tooth restoration, or a tooth model, said method comprising the steps of:

a) generating a plurality of electronic data sets of a certain tooth type by scanning a predetermined minimum number of teeth of the same tooth type;

b) assigning at least a certain number of at least one of correspondence points and correspondence structures that are characterized for this tooth type in the individual electronic data sets;

c) creating an average value from the electronic data sets by taking into account said assignment of at least one of said correspondence points and correspondence structures in the individual data sets; and

d) making available an electronic average data set derived from said average value as an electronic representation of an average tooth having an average tooth surface with respect to the scanned teeth.

2. (Currently Amended) A method of creating an electronic data set of a ~~generic~~ natural looking tooth model that can be used for creating a dental prosthetic item, a tooth restoration, or a tooth model, said method comprising the steps of:

a) scanning a predetermined minimum number of teeth of the same tooth type to provide a multiplicity of electronic data sets of this tooth type;

b) assigning at least a certain number of at least one of correspondence points and correspondence structures that are characterized for this tooth type in the individual electronic data sets;

c) carrying out a principal component analysis for at least one of the assigned correspondence points and correspondence structures of the scanned teeth; and

d) carrying out a linear combination of at least a portion of the resulting principal components for the tooth type of interest and making this available as a generic tooth model data set.

3. (Previously Presented) A method as defined in claim 1 for creating a three-dimensional electronic data set of a generic tooth model, in which, after the assignment of at least one of the correspondence points and correspondence structures, the average data set is subtracted from all of the scanned tooth data sets, after which a principal component analysis is carried out for the difference data sets, a linear combination of at least a portion of the resulting principal components is carried out for the tooth type of interest, and this linear combination is made available, together with the average data set, as a generic tooth model data set.

4. (Previously Presented) A method of creating dental prosthetic items or tooth restorations, in which, for reconstruction of a defective tooth or other defective dental prosthetic item, at least parts of the missing exterior surfaces of the dental prosthetic items or tooth restorations are built up by adapting an average tooth of the desired tooth type to at least one of the existing remaining tooth structure , opposing tooth, adjacent tooth state and bite registration, the average tooth being computed by averaging the electronic data sets of a relatively large number of scanned tooth surfaces of a specific tooth type, after the greatest possible number of at least one of correspondence points and correspondence structures between the data sets has been previously assigned, and the average value taken exactly between at least one of the correspondence points and corresponding structures and therefore of the associated individual coordinates has been formed, after which the item is machined following appropriate adaptation.

5. (Previously Presented) A method of creating dental prosthetic items or tooth restorations, in which, for reconstructing a defective tooth or a defective dental prosthetic item, at least parts of

the missing exterior surfaces of the dental prosthetic items or tooth restorations are built up by optimizing a generic tooth model data set of the desired tooth type to at least one of the existing remaining tooth structure, opposing teeth, adjacent tooth state and bite registration, such that the linear factors of at least the most important principal components, which have been determined by principal component analysis methods from the electronic data sets of a certain number of scanned tooth surfaces, are varied such that the selected optimization criteria are satisfied by minimizing an error function, and, after successful adjustment to the remaining dentition condition and following creation of the data set, the reconstructed dental prosthetic item or the reconstructed tooth restoration is produced in a machine.

6. (Previously Presented) A method as defined in claim 1, in which the assignment of at least one of the correspondence points and correspondence structures is carried out automatically.

7. (Previously Presented) A method as defined in claim 1, in which, for the assignment of at least one of the correspondence points and correspondence structures, a weighted combination is used taken from at least one of height values, gradients and curvatures of the corresponding electronic data.

8. (Previously Presented) A method of using an electronic representation of an average tooth or generic tooth model, as obtained using a method as defined in claim 1, as an electronic template for the creation of physical tooth models, tooth restorations, or dental prosthetic items using a machine that is controlled by the average data set, or generic tooth model data set, or by parts of these data sets.

9. (Previously Presented) A method of creating physical dental prosthetic items or tooth restorations for defective teeth or for defective dental prosthetic items, using an electronic representation of an average tooth, or generic tooth model, as obtained using a method as defined in claim 1, said method comprising the steps of:

a) carrying out a three-dimensional scan of a preparation of the defective tooth or of a defective dental prosthetic item, and creating an electronic data set representing the preparation or defective dental prosthetic item;

b) selecting at least one of characteristic correspondence points and correspondence structures from the electronic information of the scanned preparation, or of the scanned defective dental prosthetic item, for the tooth type of the defective tooth, or for the tooth type appropriate to the defective dental prosthetic item;

c) assigning at least one of the correspondence points and the correspondence structures in the electronic data sets of the scanned preparation or defective dental prosthetic item in accordance with at least one of the correspondence points and correspondence structures in the data set of the average tooth, or the generic tooth model;

d) approximating at least one of the correspondence points and correspondence structures that are assigned to each other to the greatest extent possible using an optimization method;

e) making the data set obtained by the optimization the basis of the reconstruction of the missing part of the defective tooth, or for building up the defective dental prosthetic item; and

f) creating a physical dental prosthetic item or a physical tooth restoration for the defective tooth or for the defective dental prosthetic item using a machine that is controlled in accordance with the data set obtained in step e).

10. (Previously Presented) A method as defined in claim 9, for creating a three-dimensional electronic data set of dental prosthetic items or tooth restorations, in which, after at least one of

the correspondence points and structures of at least one of the defective tooth and the defective dental prosthetic item have been assigned to the generic tooth model data set, the linear factors for the portion of the principal components used are optimized, such that the new linear combination is adapted to the greatest extent possible to the correspondences, or is brought into register therewith.

11. (Original) A method as defined in claim 10, in which the linear factors are determined by minimizing the distances between the correspondence points.

12. (Currently Amended) A method as defined in claim ~~11~~ 10, in which the linear factors are determined such that the probability for the determined linear combination is as high as possible.

13. (Currently Amended) A method as defined in claim ~~12~~ 9, in which said optimization takes into account the significance of at least one of specific correspondence points and correspondence structures in the form of weighting factors.

14. (Currently Amended) A method as defined in claim ~~13~~ 9, in which electronic data sets of at least one of a functional bite registration and a static bite registration are taken into account.

15. (Previously Presented) A method as defined in claim 14, in which the information of the bite registration is taken into account in creating at least one of the correspondence points and correspondence structures for reconstructing at least one of the defective tooth and the defective dental prosthetic item.

16. (Previously Presented) A method as defined in claim 15, in which the possible regions of the contact points with the opposing tooth/teeth are determined as at least one of correspondence points and correspondence structures, in that, by superimposing the data set of the static/occlusal bite registration over the data sets of the functional bite registration, the regions showing short distances between the bite registrations are selected.

17. (Currently Amended) A method as defined in claim ~~16~~ 9, in which, for creating at least one of the correspondence points and correspondence structures for the reconstruction of at least one of the defective tooth and the defective dental prosthetic item, electronic data are included that are derived from at least one adjacent tooth, opposing tooth, and symmetrically opposite tooth.

18. (Previously Presented) A method as defined in claim 17, in which, using at least one of deformation and morphing, the data set that is determined by optimization is adjusted in the regions in which irregularities or interference occur with respect to at least one of the preparation, the remaining tooth structure and the bite registration and, if appropriate, at least one of the adjacent tooth and opposing tooth.

19. (Previously Presented) A method as defined in claim 18, in which the average data set, or the generic tooth model data set, is represented graphically such that at least one of the correspondence points and correspondence structures that correspond to at least one of the scanned preparation, defective dental prosthetic item, bite registration and adjacent tooth/teeth can be directly selected (clicked) in this electronic graphic representation of the average tooth data set, or the generic tooth model data set.

20. (Currently Amended) A method as defined in claim ~~19~~ 18, in which the average data set, or the generic tooth model data set, is graphically represented for indicating at least one of correspondence points and correspondence structures together with the scanned data sets of at least one of the preparation, defective dental prosthetic item, , bite registration/positions and adjacent tooth/teeth.

21. (Withdrawn) A method of creating dental prosthetic items or tooth restorations, said method comprising the steps of:

- carrying out a three-dimensional scan of a prepared tooth, or of a plurality of prepared teeth that are referenced in space with respect to each other,

- carrying out a three-dimensional scan of the opposing jaw in the vicinity of the preparations or, alternatively, of a functional bite registration in the region of the preparation or a static/occlusal bite registration,

- storing the measured data as electronic digital data, and wherein

the bite registration(s) are referenced or registered in the same coordinate system on the basis of remaining tooth structure, adjacent tooth/teeth, or gums present in the vicinity of the preparation, after which the library tooth surface most suitable for this purpose is selected from a digitally stored tooth library on the basis of at least one of remaining tooth structure, and by selecting at least one of specific correspondence points and correspondence structures, this library tooth surface being fitted at least one of interactively and automatically using software routines to fit it to the remaining tooth structure, to at least one of the adjacent tooth or teeth and to the bite registration/opposing teeth, the missing external surfaces being built up by stipulating the position of at least one of approximal contact, oral, and vestibular control points and appended to at least one of the marginal curves and preparation lines, so that the transition from the library tooth surface to the built-up exterior surface and from the built-up exterior surface to the remaining tooth structure in the vicinity of the preparation line is almost smooth, and, following creation of the data set, the latter is implemented to control a machine for creating the desired dental prosthetic item or the desired tooth restoration.

22. (Withdrawn) A method of creating dental prosthetic items or tooth restorations, said method comprising the steps of:

- carrying out a three-dimensional scan on a prepared tooth, or on a plurality of prepared teeth that are referenced in space with respect to each other,

- carrying out a three-dimensional scan on the opposing jaw in the vicinity of the preparations or, alternatively, on a functional bite registration in the vicinity of the preparation or a static/occlusal bite registration,

- storing the measured data as electronic digital data, and the bite registration/positions are referenced or registered in the same coordinate system on the basis of remaining tooth structure, adjacent tooth/teeth, or gums present in the vicinity of the preparation, after which the library tooth surface most suitable for this purpose is selected from a digitally stored tooth library on the basis of at least one of remaining tooth surfaces and by selecting at least one of specific correspondence points and correspondence structures, this tooth surface being adjusted at least one of interactively and automatically using software routines to fit it to the remaining tooth structure, to at least one of the adjacent tooth or teeth and to the bite registration or opposing teeth, regions where the library tooth surface overlaps the remaining tooth structure are cut off to comply with the existing preparation limit, the missing external surfaces being built up by stipulating the position of at least one of approximal contact, oral and vestibular control points and appended to at least one of the marginal curves and preparation lines, so that the transition from the library tooth surface to the built-up exterior surface and from the built-up exterior surface to the remaining tooth structure in the vicinity of the preparation line is almost smooth, and, following creation of the data set, the latter is implemented to control a machine for creating the desired dental prosthetic item or the desired tooth restoration.

23. (Withdrawn) A method as defined in claim 22, in which a tooth library of three-dimensionally scanned data sets of natural tooth surfaces is used, and a data set is created for each tooth surface, containing the tooth type and at least one of the associated correspondence points and correspondence structures, of which at least one part is used for the assignment to the corresponding correspondence points or correspondence structures of at least one of the remaining tooth, the preparation, the adjacent teeth, the opposing jaw and the bite registration.

24. (Withdrawn) A method of creating tooth restorations as defined in claim 23, in which the abrasion of the tooth surface to be reconstructed is adjusted to suit at least one of the defective tooth, the defective dental prosthetic item, and the remaining dentition condition, proceeding from the generic tooth model data set by varying the linear factors of the principal components.

25. (Withdrawn) A method as defined in claim 24, in which the possible regions of contact points with the opposing tooth or teeth are determined as at least one of correspondence points and correspondence structures by superimposing the data set of the static/occlusal bite registration over the data set of the functional bite registration of the opposing jaw, and selecting those regions showing short distances between these bite registrations.

26. (Withdrawn) A method of creating tooth models or dental prosthetic items for at least one of prostheses, partial prostheses, practice models, training models, and demonstration models, in which the tooth surface of the tooth models or dental prosthetic items is formed using a generic tooth model data set, or average data set, which is created, after the greatest possible number of at least one of correspondence points and structures have been assigned between the electronic data sets of a relatively large number of scanned tooth surfaces, by averaging at least one of these data sets and by principal component analysis, the linear combination of at least the most important portions of the principal components being formed for the generic tooth model data set, and the dental prosthetic item or tooth model is created in a machine or set up as a demonstration model in a printing device or holographic template.

27. (Withdrawn) A method as defined in claim 26, wherein the surfaces of the data set of the dental prosthetic items, the tooth restoration, or the tooth model are smoothed prior to production in a numerically controlled machine in accordance with the tool geometries being used.

28. (Withdrawn) A method as defined in claim 27 for creating a dental prosthetic item or a tooth restoration having a veneer, in which a data set obtained as in claim 22, is modified such that, for the areas corresponding to the zones to be provided with a veneer, a reduced shape is

computed such that, during subsequent veneering, the distance of the new surface from the exterior surface of the reduced shape is virtually or precisely constant in at least a large proportion of the areas, and therefore the layer thickness of the subsequent veneer is virtually constant with few fluctuations.

29. (Withdrawn) A method of using a numerically controlled machine for creating tooth models, tooth restorations, or tooth dental prosthetic items, characterized in that the machine is controlled in accordance with a data set obtained according to a method as defined in claim 28.

30. (Withdrawn) A device for changing a generic tooth model data set that is obtained as defined in claim 2, having a control device which can change the linear factors of at least a portion of the principal components of the generic tooth model data set.

31. (Withdrawn) A device as defined in claim 30, having a display device which is coupled to the control device and is adapted to afford a graphic display of the generic tooth corresponding to the generic tooth model data set and to show the effect of a change in the linear factors as carried out by the control device.

32. (Withdrawn) A method of creating dental prosthetic items or tooth restorations as defined in claim 31, in which, after stipulation of, or automatic selection of, a few correspondence points between the intact remaining tooth structure and a generic tooth or average tooth or library tooth, adjustment takes place in an iterative manner, with the automatic adoption of a further number of corresponding points such that virtually all of the surface measuring points of the ground tooth material can be distinguished automatically from those of the unground remaining tooth structure, by implementing at least one distance check between the newly adjusted tooth surface and the defective tooth.

33. (Withdrawn) A method as defined in claim 32, in which the preparation limit in the transition region leading from ground or removed tooth structure to unground or unremoved tooth structure is determined by using, as information, the transition region from smaller distance

values to larger distance values between the defective tooth data set and the computed tooth surface, after carrying out computation of the tooth surface or supplementary adjustment of the tooth surface to the remaining tooth structure.

34. (Withdrawn) A method as defined in claim 33, in which the preparation limit in at least one of the immediate vicinity of the located transition region and within the located transition region is measured more precisely taking into account the areas of greatest curvature in these regions.

35. (Withdrawn) A method as defined in claim 34, in which the distances between the electronic data set of the adjusted tooth surface and of the defective tooth data set are measured approximately in the projected direction of the path of insertion.

36. (Withdrawn) A method of creating dental prosthetic items or tooth restorations as defined in claim 35, in which the desired preparation line is marked in sections in the electronic image of the defective tooth data set using a monitoring or control device, and for each section intermediate points on the surface of the data set are computed by projecting a connecting line between the points that are selected by means of said monitoring and control device in the respective direction of view.

37. (Withdrawn) A method as defined in claim 36, in which the direction of projection can be selected separately by adjusting the desired view for each section.

38. (Withdrawn) A method as defined in claim 37, in which the connecting line is a straight line, any spline curve, or a parabola.

39. (Withdrawn) A method as defined in claim 38, in which, between the clicked-on points, a connecting line is drawn through the points of the surface having maximum curvatures.

40. (Withdrawn) A method as defined in claim 39 for detecting defective areas in tooth data sets for the machine-effected fabrication of tooth restorations or dental prosthetic items, in which

the distance between the preparation limit curve, on the one hand, and a limiting curve of the reconstructed tooth surface, on the other hand, are computed point by point or section by section in arbitrary subdivided units, and only those points or sections are taken into account as part of the margin encompassing the defective area to be filled in which the shortest distance from the other curve exceeds a given or adjustable threshold value.

41. (Withdrawn) A method as defined in claim 40, in which the segments of interest, selected from the two marginal curves, are assigned, sorted, and in part extended such that in each case a segment of the marginal curve of the reconstructed tooth surface and a segment of the preparation marginal curve together establish almost the entire periphery of the said defective area of interest.

42. (Withdrawn) A method as defined in claim 41 for closing defective areas or holes in tooth data sets for the machine-effected fabrication of tooth restorations or dental prosthetic items, in which the surfaces to be built up are adapted as precisely as possible to the limiting curves of the specific defective area or hole, the gradients or curvatures of the environment being continued smoothly and continuously in the marginal area, while given or selectable points or line or surface segments are interpolated by the surface to be built up.

43. (New) A method as defined in claim 2, in which the assignment of at least one of the correspondence points and correspondence structures is carried out automatically.

44. (New) A method as defined in claim 4, in which the assignment of at least one of the correspondence points and correspondence structures is carried out automatically.

45. (New) A method as defined in claim 5, in which the assignment of at least one of the correspondence points and correspondence structures is carried out automatically.

46. (New) A method as defined in claim 2, in which, for the assignment of at least one of the correspondence points and correspondence structures, a weighted combination is used taken from at least one of height values, gradients and curvatures of the corresponding electronic data.

47. (New) A method as defined in claim 4, in which, for the assignment of at least one of the correspondence points and correspondence structures, a weighted combination is used taken from at least one of height values, gradients and curvatures of the corresponding electronic data.

48. (New) A method as defined in claim 5, in which, for the assignment of at least one of the correspondence points and correspondence structures, a weighted combination is used taken from at least one of height values, gradients and curvatures of the corresponding electronic data.

49. (New) A method of using an electronic representation of an average tooth or generic tooth model, as obtained using a method as defined in claim 2, as an electronic template for the creation of physical tooth models, tooth restorations, or dental prosthetic items using a machine that is controlled by the average data set, or generic tooth model data set, or by parts of these data sets.

50. (New) A method of using an electronic representation of an average tooth or generic tooth model, as obtained using a method as defined in claim 4, as an electronic template for the creation of physical tooth models, tooth restorations, or dental prosthetic items using a machine that is controlled by the average data set, or generic tooth model data set, or by parts of these data sets.

51. (New) A method of using an electronic representation of an average tooth or generic tooth model, as obtained using a method as defined in claim 5, as an electronic template for the creation of physical tooth models, tooth restorations, or dental prosthetic items using a machine that is controlled by the average data set, or generic tooth model data set, or by parts of these data sets.

52. (New) A method of creating physical dental prosthetic items or tooth restorations for defective teeth or for defective dental prosthetic items, using an electronic representation of an average tooth, or generic tooth model, as obtained using a method as defined in claim 2, said method comprising the steps of:

a) carrying out a three-dimensional scan of a preparation of the defective tooth or of a defective dental prosthetic item, and creating an electronic data set representing the preparation or defective dental prosthetic item;

b) selecting at least one of characteristic correspondence points and correspondence structures from the electronic information of the scanned preparation, or of the scanned defective dental prosthetic item, for the tooth type of the defective tooth, or for the tooth type appropriate to the defective dental prosthetic item;

c) assigning at least one of the correspondence points and the correspondence structures in the electronic data sets of the scanned preparation or defective dental prosthetic item in accordance with at least one of the correspondence points and correspondence structures in the data set of the average tooth, or the generic tooth model;

d) approximating at least one of the correspondence points and correspondence structures that are assigned to each other to the greatest extent possible using an optimization method;

e) making the data set obtained by the optimization the basis of the reconstruction of the missing part of the defective tooth, or for building up the defective dental prosthetic item; and

f) creating a physical dental prosthetic item or a physical tooth restoration for the defective tooth or for the defective dental prosthetic item using a machine that is controlled in accordance with the data set obtained in step e).

53. (New) A method of creating physical dental prosthetic items or tooth restorations for defective teeth or for defective dental prosthetic items, using an electronic representation of an average tooth, or generic tooth model, as obtained using a method as defined in claim 4, said method comprising the steps of:

a) carrying out a three-dimensional scan of a preparation of the defective tooth or of a defective dental prosthetic item, and creating an electronic data set representing the preparation or defective dental prosthetic item;

b) selecting at least one of characteristic correspondence points and correspondence structures from the electronic information of the scanned preparation, or of the scanned defective dental prosthetic item, for the tooth type of the defective tooth, or for the tooth type appropriate to the defective dental prosthetic item;

c) assigning at least one of the correspondence points and the correspondence structures in the electronic data sets of the scanned preparation or defective dental prosthetic item in accordance with at least one of the correspondence points and correspondence structures in the data set of the average tooth, or the generic tooth model;

d) approximating at least one of the correspondence points and correspondence structures that are assigned to each other to the greatest extent possible using an optimization method;

e) making the data set obtained by the optimization the basis of the reconstruction of the missing part of the defective tooth, or for building up the defective dental prosthetic item; and

f) creating a physical dental prosthetic item or a physical tooth restoration for the defective tooth or for the defective dental prosthetic item using a machine that is controlled in accordance with the data set obtained in step e).

54. (New) A method of creating physical dental prosthetic items or tooth restorations for defective teeth or for defective dental prosthetic items, using an electronic representation of an average tooth, or generic tooth model, as obtained using a method as defined in claim 5, said method comprising the steps of:

a) carrying out a three-dimensional scan of a preparation of the defective tooth or of a defective dental prosthetic item, and creating an electronic data set representing the preparation or defective dental prosthetic item;

b) selecting at least one of characteristic correspondence points and correspondence structures from the electronic information of the scanned preparation, or of the scanned defective dental prosthetic item, for the tooth type of the defective tooth, or for the tooth type appropriate to the defective dental prosthetic item;

c) assigning at least one of the correspondence points and the correspondence structures in the electronic data sets of the scanned preparation or defective dental prosthetic item in accordance with at least one of the correspondence points and correspondence structures in the data set of the average tooth, or the generic tooth model;

d) approximating at least one of the correspondence points and correspondence structures that are assigned to each other to the greatest extent possible using an optimization method;

e) making the data set obtained by the optimization the basis of the reconstruction of the missing part of the defective tooth, or for building up the defective dental prosthetic item; and

f) creating a physical dental prosthetic item or a physical tooth restoration for the defective tooth or for the defective dental prosthetic item using a machine that is controlled in accordance with the data set obtained in step e).

55. (New) A method as defined in claim 14, in which, using at least one of deformation and morphing, the data set that is determined by optimization is adjusted in the regions in which irregularities or interference occur with respect to at least one of the preparation, the remaining tooth structure and the bite registration and, if appropriate, at least one of the adjacent tooth and opposing tooth.

56. (New) A method as defined in claim 55, in which the average data set, or the generic tooth model data set, is graphically represented for indicating at least one of correspondence points and correspondence structures together with the scanned data sets of at least one of the preparation, defective dental prosthetic item, , bite registration/positions and adjacent tooth/teeth.